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SYNTHESIS AND ANTIMICROBIAL ACTIVITY OF MAGNETIC O-CARBOXYMETHYLCHITOSAN CONTAINING SILVER NANOPARTICLES

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Introduction: Silver nanoparticles (AgNPs) has potent antimicrobial activity, and microorganisms has difficulty to develop resistance to it. However, its use is still limited due to problems of toxicity and aggregation of particles that can interfere considerably in their activity. The coating of these particles with biopolymers such as chitosan, and the presence of magnetic particles (MNP) which has the power to vectorize the treatment and remove this system of the environmental are possible alternatives to solve these problems. Based on this context, this work aims the synthesis, characterization, and evaluation of antimicrobial activity of magnetic O-carboxymethyl chitosan (OC) nanoparticles containing AgNPs. **Methods:** MNPs were synthesized by the coprecipitation method of ferric and ferrous ions in an alkaline medium. The OC was synthesized from chitosan through the mechanism of bimolecular nucleophilic substitution reaction. The MNPs were incorporated in the OC, then crosslinked with glutaraldehyde. Synthesis of AgNPs was conducted *in situ* using different reducing agents ($NaBH_4$, sucrose, and without agent). The magnetic nanoparticles were characterized by TEM and the magnetic properties of the sample were studied with a PPMS magnetometer (Quantum Design). The silver content was determined by microwave plasma - atomic emission spectrometry. The minimum inhibitory concentrations (MIC) of the material for *Eschechia coli, Staphylococcus aureus,* and *Candida albicans* were carried out in 96-well microtiter plates using a standard 2-fold broth microdilution of the antibacterial agents. **Results:** The synthetized magnetic nanoparticles (γ-Fe_2O_3) have spherical shape and exhibit good crystallinity. The particles diameters giving the average size of 9.2±2.8 nm. The magnetization curves are roughly reversible, indicating that maghemite nanoparticles transit to a superparamagnetic state. The saturation magnetization of pure magnetic nanoparticles at room temperature is 63.34 meu/g. Silver nanoparticles prepared without reducing agent are the smallest (~5±3 nm). The average size of silver particles prepared with $NaBH_4$ are in the range of 5-15 nm, and for samples prepared with sucrose, the average particle size is 10-25 nm. Nanocomposites submitted to antimicrobial tests showed excellent antimicrobial activity against *Staphylococcus aureus* and *Escherichia coli*, and good activity against *Candida albicans*. The nanocomposite synthesized with sucrose presented better activity, with MIC of 15.625 mg/L for *E. coli* and *S. aureus* and 125 mg/L for *C. albicans*. **Conclusion:** This study provides novel insight into the antimicrobial potency of silver nanoparticles (using eco-friendly methodologies in the synthesis), which hold promise for the development of the next generation of antibiotics.

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